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Applying Brain Research to Classroom Strategies

Diane C. Persellin
Trinity University, dpersell@trinity.edu

John W. Flohr

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by Diane Persellin and John W. Flohr

Research in the field of neuroscience has exploded in the past decade. The word *brain* appears in the title of nearly 40,000 books and CDs indicating intense interest in this area of study. What can music educators learn from recent investigations—often termed *brain research*—to guide music teaching and learning? The following ideas are intended to have broad applications and may inspire you to investigate this fascinating area of literature more thoroughly. While some findings are new, other studies affirm what music educators have previously found to be effective.

First Things First

Recent investigations have verified that we tend to remember best the information or experiences that are presented first. Information presented last is remembered second best. Recall of skills and concepts presented just past the middle of class is the weakest. These findings are known as primacy and recency in *serial position effect* (Reed, 2004; Terry, 2005).

Teaching Applications:

- Music teachers can capitalize on this information and teach the most important skills and concepts at the beginning of class when retention tends to be best.
- After the midpoint of class, make announcements, work in small groups, take a break, or change the pace.
- Plan to end class strongly with closure that is memorable and involves a review or a mini-performance of the piece rehearsed that day.

Repeat to Learn—Remember to Repeat

Repetition converts short-term learning to long-term learning. Learning is strengthened effectively through imitation that includes a twist to avoid boredom. Long-term memory becomes more reliable by incorporating new information gradually and repeating it regularly to strengthen memory connections. Talking about an event immediately after it occurs enhances memory for that event (Brown, 2004; Squire, 2004).

Teaching Applications:

- A short review of previous learning primes students for new learning. Reviewing scale degrees or a fingering learned previously prepares students for the next step. We can't assume that students easily remember what was taught in the previous class.
- Repeat new concepts or skills using different music, different learning modalities such as visual or kinesthetic ways of teaching, or even by standing in a different place in the room.
- Repeat objectives every 10 minutes. Give mini-closure by restating the objective at the end of each activity or event in class and then again at the end of class.
- Combine seeing, manipulating, and discussing review words. This reinforces learning and strengthens connections. At the closure of the class, word walls can be used to review concepts, skills, and information learned.

Better Attention Equals Better Learning

The brain doesn't pay attention to boring things. The more attention the brain pays to a given stimulus, the more elaborately information will be encoded and retained. Information that best grabs attention:

(1) is related to previous learning. The brain uses past experience to predict whether we should pay attention.

(2) provides the big picture before details. The brain initially

remembers overall emotional components of an experience rather than details.

(3) is emotionally laden. When the brain detects an emotionally charged event, part of the brain (the amygdale) releases dopamine into the system which aids memory and information processing (Medina, 2008; Turk-Browne, Yi, & Chun, 2006). (See subsequent research conclusion on positive experiences.)

Teaching Applications:

- At the beginning of class, briefly give students a verbal or visual plan to provide an overview of what will be learned so the brain can focus on learning rather than trying to multitask to seek meaning.
- Connect new learning to previous learning. Students don't always see connections, so they need to be reminded of them to make learning relevant and to create associations between concepts.
- Use metaphors and tell stories to create a mood when introducing new music.

Positive Experiences Affect Learning

Positive and successful learning activities stimulate the brain to reward itself through the release of hormones. The release of these hormones, such as serotonin and dopamine, is found to result in feelings of satisfaction (Medina, 2008; Turk-Browne, Yi, & Chun, 2006). Music activities stimulate areas on both sides of the brain and are associated with emotion, reward, and motivation (Blood & Zatorre, 2001; Brown, Martinez, & Parsons, 2004). Learning that occurs in a positive, safe, and affirming environment links new material with pleasant feelings so that recall of information brings back the positive affect.

Teaching Applications:

- A positive teacher attitude and passion for music goes a long way in making learning pleasant and successful. While school is serious business, we learn more deeply when we are having fun.
- Teachers who demonstrate enthusiasm for teaching music and encourage active participation from students will promote engaging and enjoyable learning.
- Make repertoire selections relevant to encourage positive learning. For example, before a band, choir, or orchestra concert, use several learning strategies to learn about and understand the music to be performed.
- Celebrate learning. Congratulate students on their progress.

Actively Engage Students

Cognitive scientists working with the Dana Consortium (Gazziniga, 2008) confirmed the advantages of active, hands-on learning. The entire body is interconnected with the brain and responds to and is stimulated by active engagement (Flohr & Trollinger, 2010).

Teaching Applications:

- Rather than just listening to drums or watching a video of a performance, have students play African drums; we learn by doing. If listening is required, structure lessons to be active, hands-on listening.
- Encourage movement in performance. Accomplished artists move

while performing. Also review Eric Jensen's 15 tools for engagement based on brain research, including call-response, walking fast to music, and repetitive gross movement (Jensen, 2003).

Multisensory Input Strengthens Connections and Retrieval

The more elaborately we encode a memory, the deeper the learning will be as the brain has to work harder to process information. Approaching a concept from multiple angles strengthens overall understanding. Our senses evolved to work together so we learn best if we stimulate several senses at once (Flohr, 2004, 2010; Medina, 2008).

Teaching Applications:

- When teaching a rhythm pattern, invite students to hear it, chant and count it aloud, see it graphically or through notation, feel it kinesthetically with another student, clap or pat it, play it on a drum, and move to it. These multiple inputs strengthen the concept as well as make it easier to access later by retrieving newly-learned material from any of the sensory modes individually.
- When teaching a melodic contour, sing it, show it with hands, draw it in the air and on the board, listen to the other half of the class sing it while moving, and discuss how it moves. Ask students to point to the contour on the board while you or another student draws it.
- Make it a priority that teaching and learning be rich, multisensory experiences.

Make Learning Relevant and Engaging

Students may not automatically understand why it is important to learn a fact or skill and may tune us out. Learning information that is personally meaningful to the learner is critical. Teachers can facilitate learning by connecting new learning challenges to students' interests and skill levels. Comprehension is enhanced through the application of relevant experiences and instruction which builds on prior knowledge (Braun & Bock, 2007; Caine, 2005).

Teaching Applications:

- Creative and successful teachers find ways to make connections of seemingly unrelated concepts to students' lives. Why should sixth-grade general music students learn about Beethoven?
- Match music tasks with students' skill levels. This may mean stratifying group tasks into multiple levels of difficulty and matching students to their appropriate levels. When students are totally engaged in tasks with levels of challenge that match their levels of competence, they are likely to feel energized, satisfied, and happy. If tasks are too difficult, students feel frustrated; if tasks are too simple, they are bored.

Imitation Is a Primary Way to Learn

Good modeling of vocal sound, healthy habits when singing, playing instruments, and listening are essential in music classrooms. Studies with human subjects have led to the identification of *mirror neurons* (Doidge, 2007; Jossey-Bass, 2008; Steen, 2007). These are neurons that fire when humans see or hear someone performing an action or when we perform the action ourselves. Thus, the brain has built-in mechanisms that help us learn by imitation.

Learning by imitation accelerates the process because the learner does not have to start from scratch. Through imitation, we can learn from experts. It is more difficult for a novice to imagine a finished product unless presented with a model.

Teaching Applications:

- Teachers should model behaviors they want students to emulate and provide high-quality examples of music performance. While this is self-evident, one should strive for a higher standard when working with novice or experienced musicians. If the only model a beginning violinist had was her own out-of-tune playing, she would never move toward the sound and look of an accomplished artist.
- It is not enough to model specific behaviors from time to time; rather, teachers should *constantly* model appropriate behaviors. Students are always observing teachers. It should always be a case of *do as I do* rather than *do as I say.*

Move to Learn

Fox, Parsons, and Hodges (1999) found that the area of the brain that controls movement is activated when humans listen to music. The human brain learns from the body; it teaches the body how to deal with forces that arise when moving, how to pick up environmental information to guide movement toward anticipated goals, and sets the foundation for human dynamics of music. Rote memorization, mindless repetition, skimming of material, and drill may not be as effective to form connections. Moving large and small muscles through singing and

moving may lead to longer-term recall (Flohr & Trevarthen, 2008).

Teaching Applications:

- In music ensembles and elementary classrooms, move! Teach music in such a way that every student is motivated to move, dance, clap, or pat to music. Dalcroze eurhythmics strategies can provide effective ways to engage students at all levels.
- Plan to have students meaningfully and regularly move during every class. Don't let students sit or stand too long without moving.

Improvise to Activate the Brain

Students become actively engaged when given an opportunity to explore musical instruments. Researchers have found that the brain is more activated when improvising music than when simply reproducing music by singing or playing. Bengtsson, Csikszentmihalyi, and Ullen (2007) explored brain patterns and creativity during a study on improvisation with pianists. Using magnetic resonance imaging, brain wave patterns of 11 pianists were recorded as they played a piano with their right hand. Subjects improvised, played a memorized passage, and rested. Results demonstrated that the brain worked harder (more brain activation) when students improvised than when they played the memorized passage or when they rested. Results were similar to those of another study conducted by Haier & Jung (2008).

Teaching applications:

- Invite young students to improvise responses to musical questions, to create their own story songs and Orff instrument accompaniments, and to work with puppets that like to sing rather than speak. By encouraging their ability to improvise within parameters of musical restrictions, children learn that their music and creativity are valued.
- Older students can create answers to musical questions, can improvise within a specified tonality, can write their own raps accompanied by a beat box, can practice scatting over a blues accompaniment, and more.

Coda

The importance of research-based practice in music education cannot be

overstated. While many recent studies confirm what we intuitively sense works in teaching, research can also guide us to find new teaching strategies. These new approaches may engage students more effectively and lead to greater retention and deeper musicality. Other publications can provide additional resources and more in-depth discussion of the cognitive and neuroscience in these studies (Flohr, 2010; Hodges, 2010; Persellin, 2009).

As a profession, we are at the threshold of utilizing developing technology for studying how the brain functions and analyzing which music teaching strategies are most effective to maximize our efforts. Recent research holds the promise of a fuller understanding of the learning process, guiding music educators in the development and use of more effective teaching strategies.

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Diane Persellin is Professor of Music Education at Trinity University and John W. Flohr is professor emeritus from Texas Woman's University and on the faculty of the Richard W. Riley College of Education and Leadership at Walden University.

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